DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11-09-2009 has been entered.

Status of Claims

2. In the amendment to claims filed November 9th, 2009: all previously pending claims were cancelled and new claims 59-66 have been added.

Claim Objections

3. **Claims 59, 61, 63 and 65** are objected to because of the following informalities:

On line 7 of claim 59, applicant recites “etching" droplets from a nozzle, when they certainly intended to recite "ejecting."

On line 2 of claims 61 and 65, applicant recites "are targeted *ion* such a manner” when they certainly intended to recite “are targeted *in* such a manner.”

On line 4 of claim 63, applicant recites “oixels" when they certainly intended to recite "pixels."

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. **Claims 63-66** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In particular, independent **claim 63** requires that "the wiring being formed so as to have a height lower than that of the light emitting layer." The examiner finds that the barrier layer is supported to have this relative height, but as far as the examiner can determine, there is no indication in the specification as to the relative height of the wiring, in particular the black matrix wiring. However, the specification is very long, so the applicant is encouraged to find support for this limitation if the examiner inadvertently missed it.

5. **Claims 64-66** are rejected for depending upon claim 63.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. **Claims 59-66** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "smooth" in claims 59 and 63 is a relative term which renders the claim indefinite. The term "smooth" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree of smoothness

required to meet the limitation, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. For the purposes of examination, it will be assumed that the resulting smoothness of the layers in the applied art is sufficiently smooth in order to meet the claim limitations.

7. **Claims 60-62 and 64-66** are rejected for depending on a rejected claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. **Claims 59-66** are rejected under 35 U.S.C. 103(a) as being unpatentable over Seki et al (US 2002/0067123) in view of Himeshima et al (US 20010009689) in view of Chang et al (US 2002/0118251) in view of Hawkins et al (US 2002/0130931) in view of Silverbrook (US 6284147) in view of Akahira et al (US 6394578).

The instant claims are directed towards a method of producing a display element comprising the steps of:

a. Preparing a substrate
b. Forming a first electrode on the substrate
c. Forming a wiring on the first electrode, between pixels having different colors,
d. Forming a light emitting layer by ejecting droplets of light emitting material from a nozzle of an inkjet apparatus onto the first electrode of a light emitting layer formation region between the wiring, the droplets having a viscosity of 20cPs or more and are 1 pl or less in amount, the light emitting layer being formed while an electric field is generated between an electrode of the nozzle and a counter electrode positioned as to face the electrode; and
e. Forming a second electrode on the light emitting layer.
f. The wiring is formed at a height lower than the light emitting layer, and the droplets are ejected plural times while shifting landing positions of the

droplets in the light emitting layer forming region so that the droplets overlap to form two or more layers, in order to attain a smooth surface of the light emitting layer.

Seki et al is directed towards a method for forming an EL device for a display [0001]. The process for forming the device shown in figure 1 comprises: preparing a substrate **10**, patterning a first electrode **11** onto the substrate, forming a barrier **12** between pixels on the first electrode out of silica [0030], forming a light emitting layer **18** [0032] by ejecting droplets from an inkjet apparatus [0029] onto the first electrode between the barrier **12**, so that the barrier is lower than the light emitting layer (both seen in figure 1), and then forming a second electrode **19 (or 23)** on the light emitting layer [0033-0034].

Seki et al teaches forming a barrier layer structure, which is located in the same location as applicants wiring, but it does not teach that it is a wiring structure. However, **Himeshima et al** is also directed towards a process for forming an EL device for displays [0001], as shown in figure 14, it teaches applying a comparable barrier structure (first spacers) **3** on the first electrode **2** of their device to perform the same function as Seki (divide the pixels) [0076], which can, also like Seki, be made out of silica. Himeshima et al further teaches that these barrier structures can also be made out of conductive material (a wiring) as long as there is still some insulation isolating the pixels, that they can be blackened in order to have them function as a black matrix material, increasing the contrast between pixels, and that chromium metal is a suitable material for this function [0077].

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to modify the structure of Seki et al in view of Himeshima et al to replace the barrier structure with a (partially) conductive (a wiring) structure, in order to increase the conductivity of the pixel, to blacken this wiring in order to increase the contrast between the pixels and to do so by using a chromium metal layer (also a conductive wiring) as part of the spacer, since it is taught to be suitable for providing the black matrix function in this application and would produce predictable results **(claims 62 and 66)**.

Regarding the limitation that the adjacent pixels be different colors, Seki et al teaches that color displays of their type are desirable [0003], but it does not teach how such a display would be arranged. However, Himeshima et al further teaches forming a color display, it teaches that EL color displays can be formed by utilizing different colored pixels (Red, Green, and Blue) which are arranged adjacent to each other as seen in figure 1, so the different color pixels can be driven to display a colored image [0058].

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to modify the device of Seki et al by placing pixels of different colors adjacent to each other, as taught by Himeshima et al in order that those different colored pixels can be driven in order to produce what appears to be a colored image, so a color display results.

Seki et al does not teach what the volume of the droplets or the size of the nozzle should be in their inkjet process.

However, **Chang et al** is directed towards inkjet deposition processes and it teaches that reducing the volume of the drops ejected by inkjet devices allows for increased resolution of the produced image. To this end, they teach that inkjet devices with drop sizes less than 1pl are commercially available in order to produce high resolution images [0003].

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use drop sizes that are as small as possible, such as of 1pl or less with the process of Seki et al in order to increase the resolution of the produced pattern, which would allow for better quality patterning and the production of higher resolution displays to be made using the Shimoda et al method.

Seki et al does not teach what the viscosity of the liquid is. However, **Hawkins et al** is directed towards inkjet deposition processes and it teaches that the fluid viscosity is a result effective variable for determining the size of the produced droplet [0094].

Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to choose the instantly claimed ranges of a "viscosity of 20cP or greater" through process optimization, since it has been held that when the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

Seki et al does not specify what kind of inkjet method is used, so it does not specifically teach using an inkjet device where there is electric field generated

between an electrode of the nozzle and a counter electrode during the deposition process (e.g. an electrostatic-type inkjet).

However, **Silverbrook et al** is directed towards depositing films by inkjet methods and teaches using an inkjet device where electrostatic attraction caused by an electric field produced between two facing electrodes (the capacitor **13**) in the nozzle causes the ink to eject. As shown in figure 2, the electrodes are part of the nozzle device (col 5, line 65 through col 6, line 25).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use an inkjet device with two such opposing electrodes in order to deposit the organic EL material layers of Seki et al since it was a known inkjet method, which would be suitable for depositing the inks and produce predictable results.

Seki et al teaches that the area of the pixel can be formed in a variety of shapes, for instance, as a stripe [0030], but it does not teach how the droplets are placed in sequence to appropriately fill that area.

However, **Akahira et al** is also directed towards ink-jet deposition of colored material to form the pixels of a display device (abstract). This ink, like that in Seki et al, is supplied into aperture regions surrounded by barriers, which define the pixels. It teaches that unevenness in the ink is problematic in the art (col 4, line 66 through col 5, line 4), and is due to non-uniform thicknesses in the ink (col 5, lines 24-27). It teaches that their deposition method to overcome this problem, the ink supplied to each pixel is provided by a series of ejected droplets provided by different nozzles in

different scans of the inkjet head. By doing this, the amount of ink supplied to each pixel is made more uniform, improving the unevenness in the ink (the non-uniformities in the layer's thickness) (figures 2A-C, col 5, lines 24-65). The teaching is made even more clear in figures 8A-9B, where Akahira et al shows this overlap between the droplets improves the uniformity of the layer and teaches that due to the time delay between the different scans, the previously deposited droplets dry (forming a first layer), so that the subsequently deposited droplets (a second layer), whose landing position is in the middle of the landing positions of two adjacent droplets previously deposited **(claims 61 and 65)**, overlap with these previously deposited droplets, the droplet size should be controlled to further reduce unevenness in the layer (col 10, line 59 through col 11, line 34).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use the deposition pattern of Akahira et al in the inkjet process of Seki et al, shifting the landing positions of the overlapping droplets as they are deposited from the inkjet head in different scans, forming two layers, in order to use different nozzles for the same pixel, and so doing improving the uniformity of the deposited layer. Increasing uniformity of a layer is understood to be generally desirable, and in this case would be further expected to improve the perceived uniformity in the color of the pixels **(claim 63)**.

8. Independent **claim 59**, does not require the wiring of claim 63, only that there be a barrier in that place (which the structure described above reads upon), and further requires a specific range of nozzle diameters. Regarding those diameters, as

discussed previously, Hawkins et al teaches that in inkjet devices, the diameter of the nozzle is a result effective variable for determining the flow of ink through the nozzle and thus the droplet size [0094].

Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to choose the instantly claimed nozzle with a "diameter from 0.2 microns to 4 microns" through process optimization, since it has been held that when the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980) **(claim 59)**.

9. Regarding **claims 60 and 64**, Silverbrook et al further teaches that when as the droplet is ejected, the meniscus expands from the nozzle outlet during ejection, as shown in figure 5, the diameter of the droplet is larger than the diameter of the nozzle outlet, so that immediately after ejection, from which it is readily apparent that the diameter of the droplet will be larger than the diameter of the nozzle outlet.

It is readily apparent that in the process of using an electrostatic ejection inkjet nozzle, that electrical charges are induced. Without any particular claimed method of defining the boundary of "a region where the charge is concentrated" or "a region of the meniscus," the examiner defines a region where the charge is concentrated that is equal in area to a region of the meniscus, meeting the claim limitation **(claims 60 and 64).**

Response to Arguments

10. Applicant's arguments with respect to claims 59-66 have been considered but are not convincing in view of the new ground(s) of rejection necessitated by amendment.

11. Regarding applicants argument on page 13 that it is difficult to produce the desired volume droplet with its viscosity, using a nozzle of the claimed size, using conventional inkjet methods, thus rendering the claims non-obvious. However, even if this combination of droplet volumes, viscosities and nozzle diameters are more difficult to produce than others (perhaps larger droplet sizes), this is not an indication that the references being relied upon would not enable a person of ordinary skill in the art to produce the desired. Neither does this motivate them not to do so since, for instance, smaller droplet sizes are shown to be desirable in the prior art, thus motivating a person of ordinary skill in the art to use them even if they are more difficult to produce than other droplets.

Regarding applicants arguments on pages 14-19 of the advantages of their process, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

12. Regarding applicant's arguments on page 19, directed to the previous combination of references, in response to applicants amendments, new art has been applied to meet the amended claim limitations.

Conclusion

13. No current claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1792

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